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Lucanus moae sp. nov., a new species from Sichuan, China (Coleoptera: Lucanidae: Lucaninae)

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Keywords:

Coleoptera; Lucanidae; *Lucanus*; *moae*; stag beetle; taxonomy; new species; description; morphology; Sichuan; China.

Abstract. – A new species of the genus *Lucanus* Scopoli, 1763 was found from Sichuan Province, China: *Lucanus moae* **sp**. **nov**.. In this paper, the new species is described, illustrated, and the differences with its related species are also discussed.

Qi Z.-H., 2021. – *Lucanus moae* **sp**. **nov**., a new species from Sichuan, China (Coleoptera: Lucanidae: Lucaninae). *Faunitaxys*, 9(23): 1 – 7.

ZooBank: http://zoobank.org/B6A06115-109A-4FD3-994F-DFDAB8C4218B

Introduction

The family Lucanidae (Coleoptera: Scarabaeoidae) contains more than 100 genera and more than 1800 species (Fujita, 2010). The mandibles of most male adults in lucanid beetles are well-developed and diverse, which attract the attention and collection of many enthusiasts and entomologists. The genus *Lucanus* Scopoli, 1763 is the type genus of Lucanidae, with approximately 94 species known in 2010 (Huang & Chen, 2010) and many species published in recent years. The total number of this genus in China is 62 at present, including several newly described species (Huang & Chen, 2010, 2013, 2017, 2019, 2020; Wang & Zhu, 2017; Wang & Zhan, 2018; Wang & Ko, 2018; Adachi, 2020; Lin, 2021).
In this paper, we describe a new medium-sized *Lucanus* species: *Lucanus moae* **sp**. **nov**. from Sichuan Province, China. Clear illustrations are provided, and features are given to distinguish this new species from other known related species.

Material and methods

Whole specimens were photographed using a Canon 5D mark IV digital camera with a 100 mm f/2.8 macro lens. A Canon MT-26EX twin flash was used as the light source. Specimens details and genitalia were photographed using a Keyence VHX-5000 digital microscope with the Keyence VH-Z20R zoom lens (20–200×). The photograph in natural habitat were taken using a OPPO smartphone. The images were processed and combined into figures using Adobe Photoshop CC 2019.

Specimens studied in this article are deposited in the following public and private collections:

– **CZHQ**: Zhi-Hao Qi' s personal collection, Wuyishan, China.
– **FAFS**: Fujian Academy of Forestry Sciences, Fuzhou, China.

Measurement criteria (mm) are used as follows:

– **Body length**: length between the apex of mandible to the elytral apex along the midline.
– **Elytral length**: length between the basal border and the apex of elytra along suture.
– **Elytral width**: widest part of both elytra combined.
– **Head length:** length between the anterior apex of clypeus and the posterior margin of occiput along the midline.
– **Head width**: widest part of head.
– **Mandible length**: length from the apex of mandible to its base at anterior margin of the head.
– **Pronotal length**: length of the pronotum along the midline.
– **Pronotal width**: widest part of pronotum.

Results

Order **Coleoptera** Linnaeus, 1758

Superfamily **Scarabaeoidea** Latreille, 1802

Family **Lucanidae** Latreille, 1804

Subfamily **Lucaninae** Latreille, 1804

Tribe **Lucanini** Latreille, 1804

Genus ***Lucanus*** Scopoli, 1763

Lucanus moae sp. nov.

(Chinese vernacular name: 莫氏深山锹甲)

(Fig. 1-5)

ZooBank: http://zoobank.org/493932A8-16D3-4665-B340-E130C0A596EC

Holotype, ♂ (FAFS), China, Sichuan Province, Huidong County, Jiamashi mountain area, 2800-2950m, 13.VI.2021, local collector leg.

Paratypes, 1♂ & 1 ♀ (CZHQ), the same collecting data as the holotype.

Description of the holotype (Fig. 1A, 1D, 2A–D, 3A–D, 4A–D)

General appearance. – Medium sized, whole body densely tiny punctate and many places setose.

Dimensions.

Body length (34.8).

Length of different body parts:
- head (5.1)
- mandible (8.1)
- pronotum (5.3)
- elytra (17.0).

Reviewer: Ri-Xin Jiang (*China*).

Width:
- head (8.9)
- pronotum (9.2)
- elytra (11.0).

Color. – Mostly reddish brown on both head dorsal and pronotum; elytra sheen, blackish brown; ventral surfaces mostly blackish brown; all tibiae and femora with large, transverse, orange stripes on dorsal and ventral surfaces.

Head. – Form transverse. Anterior ridge clearly defined and slightly raised in the middle. Lateral ridges protruded evenly in a small range, forming small rounded angles at lateral posterior corners. Canthus short and thin, dividing about 1/3 of the eye. Clypeus fused with frons, not defined by obvious transverse suture, apex nearly square. Mandible about 1.6 times as long as head, the inner side is divided into 2 parts by major inner tooth, forming 2 arcs, the outer edge formed a relatively gentle weak curve; apical fork with upper branch and lower branch are nearly equal in length, major inner tooth appear smaller but obvious and shorter than width of mandible; major inner tooth preceded by 2 smaller teeth and followed by 1 smaller tooth, there are no teeth from here to the base of mandible. Antennal club with 4 antennomeres; antennomere VII slender and sharply pointed apically; antennomeres VIII–X lamellate. Posterior margin of occiput slight protuberance.

Pronotum. – Transverse, form 1.7 times as wide as long, widest at basal 1/3, the anterior margin and the Posterior margin are 2 arc-shaped with the middle line as the boundary, and the former is more curved than the latter, and both have a row of golden setae.

Scutellum. – Near semicircle, form 1.6 times as wide as long, punctate.

Legs. – Protibia with 2 teeth along outer margin, some indistinct protuberance between large ones and next to apex bifurcate, 1 spur at apex; mesotibia with 1 small and 1 larger teeth on outer margin and 2 spurs at apex; metatibia with 1 small tooth on the outer margin and 2 spurs at apex.

Male genitalia. – 8th abdominal tergite with poorly-defined lateral angles, there is a crack in the middle of the base, extending to half of the whole along the midline. 8th abdominal ventrite posterior margin complete ossification with obvious black thickening. Ventral plate of 9th abdominal segment with most of enveloped by membrane structure, see the illustration for other details. Aedeagus, basal piece, paramere, penis and flagellum as Fig. 4A–D.

Male paratype (Fig. 1B, 1E, 2E–H), small sized.

Dimensions.

Body length (26.6).

Length of different body parts:
- head (3.5)
- mandible (4.7)
- pronotum (4.7)
- elytra (13.9)

Width:
- head (6.0)
- pronotum (7.4)
- elytra (9.0)

Variation. – In this small-sized male, color mostly blackish brown to black on both dorsal and ventral surfaces, all tibiae are black and all femora with small, transverse, orange stripes on dorsal and ventral surfaces. The head shrank by a circle, clypeus shorter, mandible about 1.3 times as long as head, apical fork of mandible smaller, number of inner teeth 1 less, major inner tooth small, not obvious; posterior margin of occiput flat and not protruding. Apex of metatibia longer and sharper.

Female paratype (Fig. 1C, 1F, 2I–L, 5A–D).

Dimensions.

Body length (24.5).

Length of different body parts:
- head (3.2)
- mandible (2.3)
- pronotum (5.0)
- elytra (14.2).

Width:
- head (5.3)
- pronotum (7.9)
- elytra (9.4).

Color. – Mostly blackish brown on both dorsal and ventral surfaces; all tibiae and femora are black.

Head. – Whole head covered with dense large punctures. Canthus short and thin, dividing about 1/3 of the eye, with both anterior and posterior angles clearly defined, lateral margin weakly concaved. Clypeus nearly half ellipse. Right mandible with low dorsal tooth, inner tooth with broad and flat inner ridge; left mandible without dorsal tooth, with 2 widely-separated inner teeth and small gap behind apex, inner margin between teeth long, weakly concave.

Pronotum. – Transverse, form 1.6 times as wide as long, widest at basal 2/5, anterior margin is 2 arc-shaped with the middle line as the boundary, the posterior margin nearly straight and both have a row of setae.

Scutellum. – Near semicircle, form 1.7 times as wide as long, punctate.

Legs. – Protibia with 2 teeth along outer margin, ever-greater from base to apex, the largest tooth has a certain distance from apex bifurcate and connected by an arc, 1 spur at apex; mesotibia with 2 teeth on outer margin and 2 spurs at apex; metatibia with 1 tooth on the outer margin and 2 spurs at apex.

Female genitalia. – 8th abdominal tergite with poorly-defined lateral angles. 8th abdominal ventrite with a membranous area in the middle and no obvious emarginate at middle of posterior margin. Hemisternite and spermatheca as Fig. 5C–D.

Diagnosis. – The males of this new species are rather similar to the same-sized males of *Lucanus fortunei*, *L. datunensis* and *L. miwai* from China, but can be distinguished from the other species by the following combination of characters:

1) protibia with 2 teeth along outer margin;

2) mandible apical fork with upper branch and lower branch are nearly equal in length, major inner tooth preceded by 2 smaller teeth and followed by 1 smaller tooth, there are no teeth from here to the base of mandible (The above 2 points may change with the size difference of males);

3) feature combination of male genitalia.

Key to males following account of characters will help to distinguish this new species from other similar species (the male external characters are confined to the medium-sized specimens only)

1.	Apical fork of mandible present	**2**
—	Apical fork of mandible absent or inconspicuous	***L. miwai*** Kurosawa, 1966
2(**1**).	Major inner tooth present	**3**
—	Major inner tooth absent or inconspicuous	***L. datunensis*** Hashimoto, 1984
3(**2**).	Major inner tooth followed by more than 1 tooth, protibia with more than 2 teeth along outer margin	***L. fortunei*** Saunders, 1854
—	Major inner tooth followed by only 1 tooth, protibia with 2 teeth along outer margin	***L. moae*** **sp. nov.**

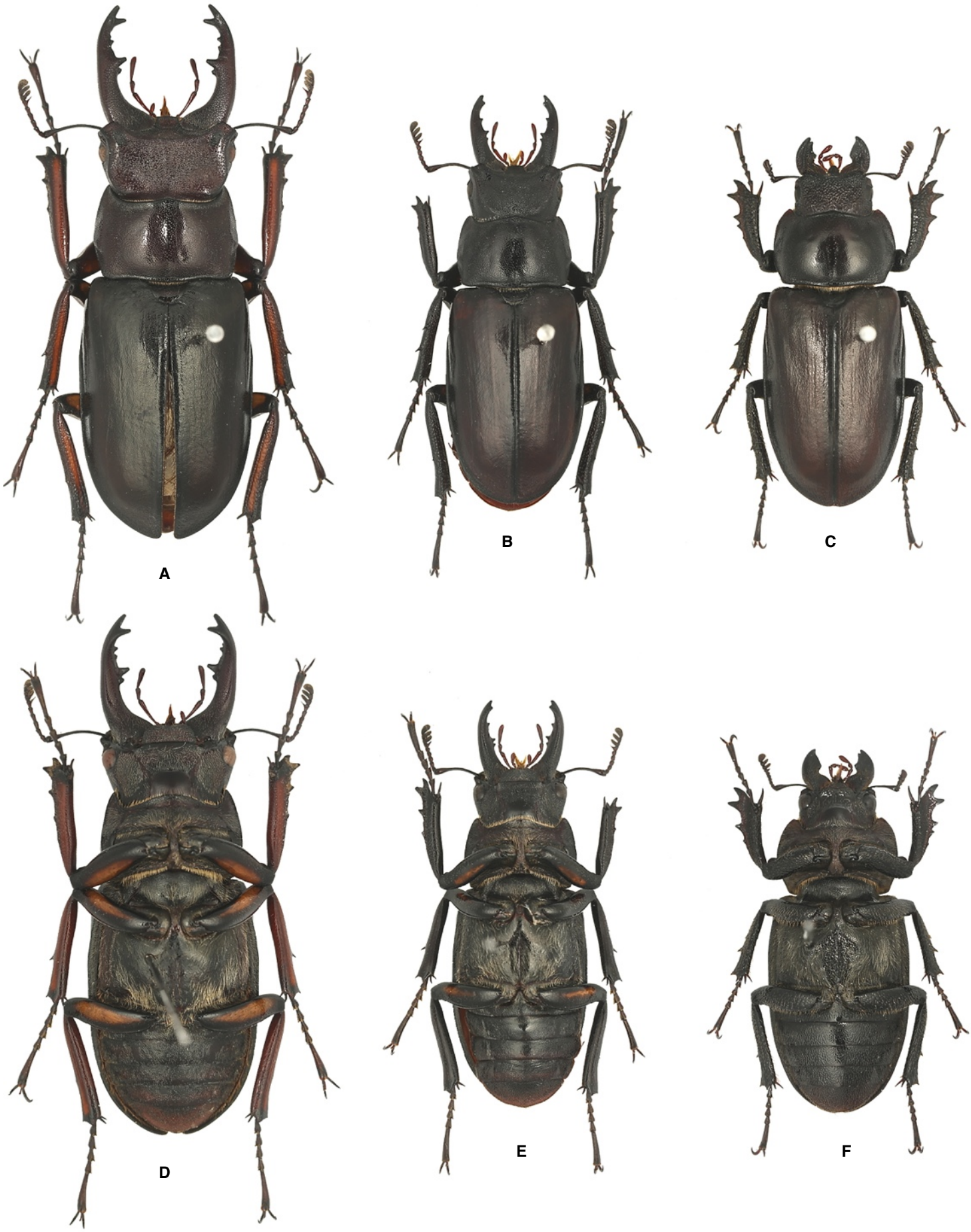

Fig. **1**. Habitus of *Lucanus moae* **sp**. **nov**. (Scale = 10 mm).
A, **D**) Holotype. **B**, **E**) Male paratype. **C**, **F**) Female paratype. **A-C**) Dorsal view. **D-F**) Ventral view.

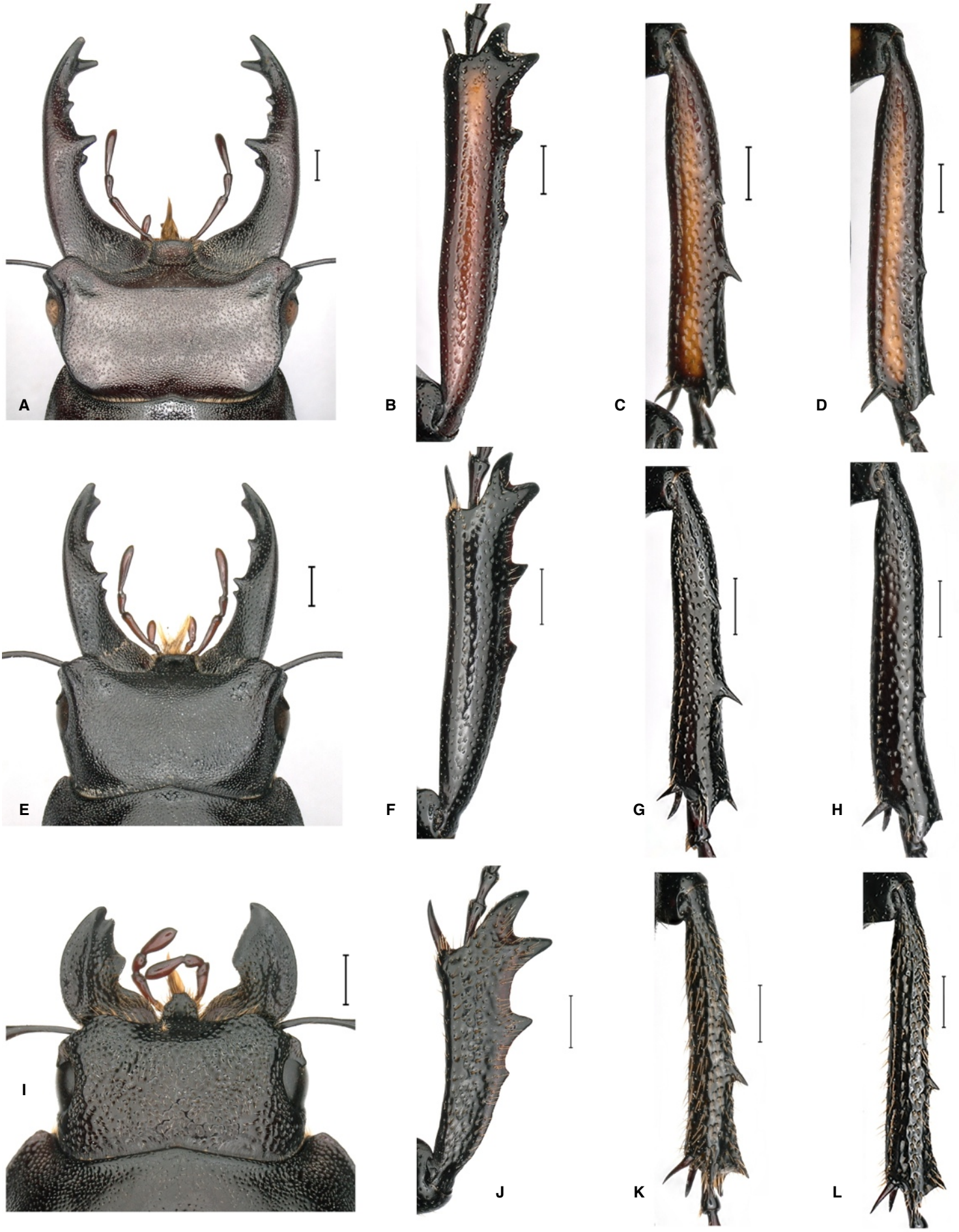

Fig. **2**. Head and tibial details of *Lucanus moae* **sp**. **nov**. in dorsal view (Scale = 1 mm).
A-D) Holotype. **E-H**) Male paratype. **I-L**) Female paratype.

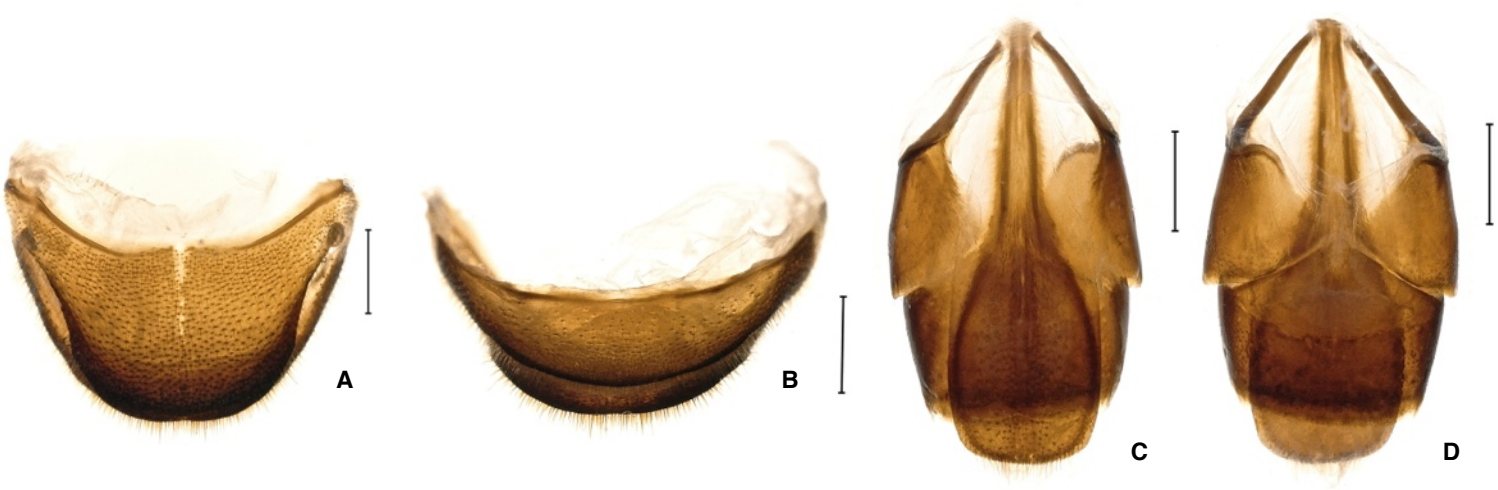

Fig. **3**. 8–9th abdominal segment of *Lucanus moae* **sp**. **nov**., holotype (Scale = 1 mm).
A-B) 8th abdominal segment. **C-D**) 9th abdominal segment. **A**, **D**) Dorsal view. **B**, **C**) Ventral view.

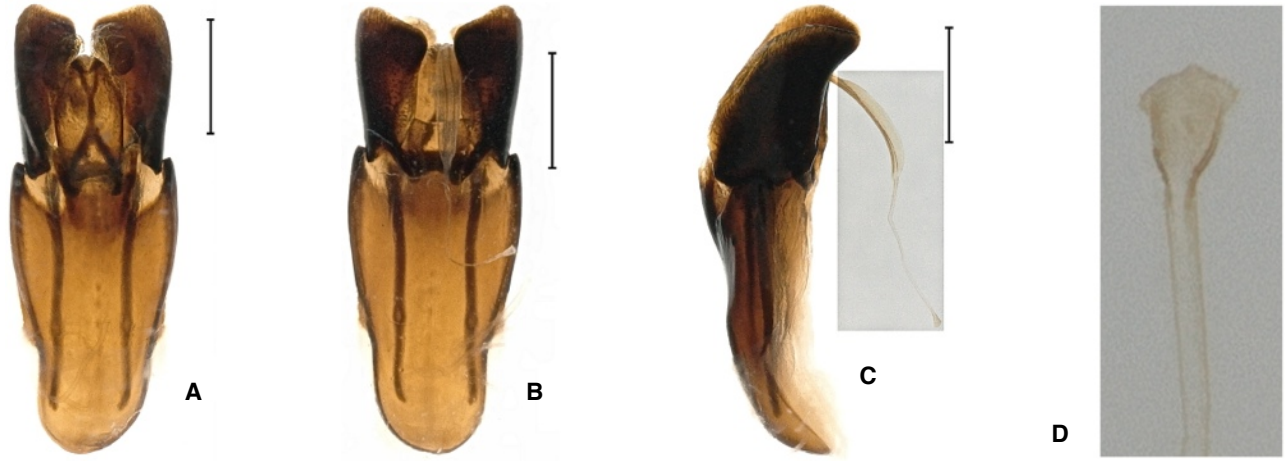

Fig. **4**. Male genitalia of *Lucanus moae* **sp**. **nov**., holotype (Scale = 1 mm). **A**)Ventral view. **B**, **D**) Dorsal view. **C**) Lateral view.

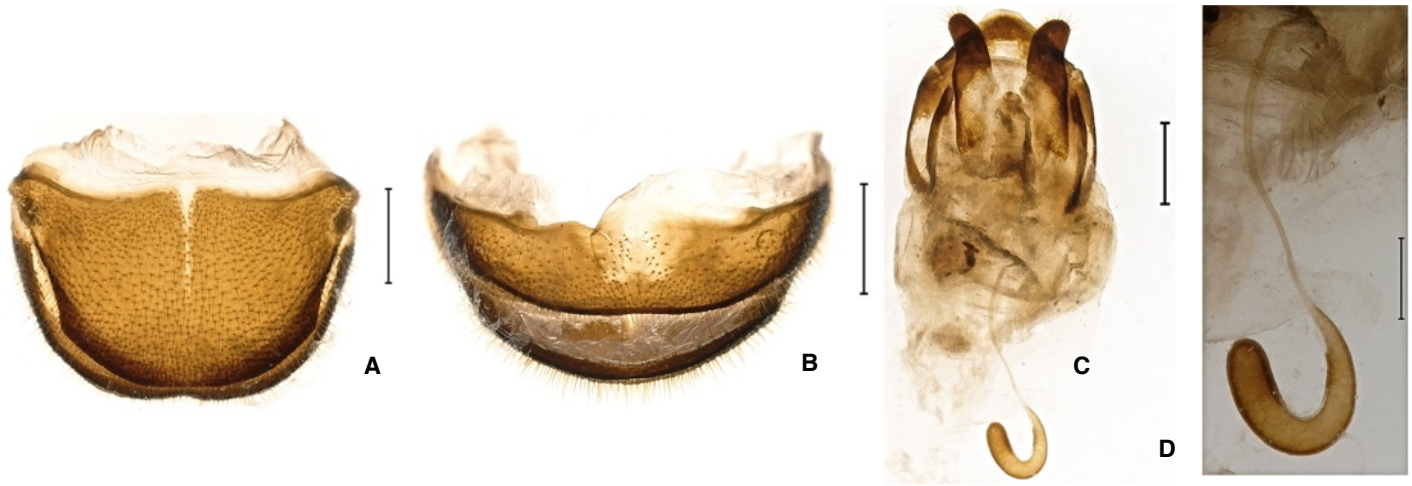

Fig. **5**. 8th abdominal segment and female genitalia of *Lucanus moae* **sp**. **nov**., female paratype (Scale in A-C = 1 mm; Scale in D = 0.5 mm).
A-B) 8th abdominal segment. **C-D**) Female genitalia. **A**) Dorsal view. **B-D**) Ventral view.

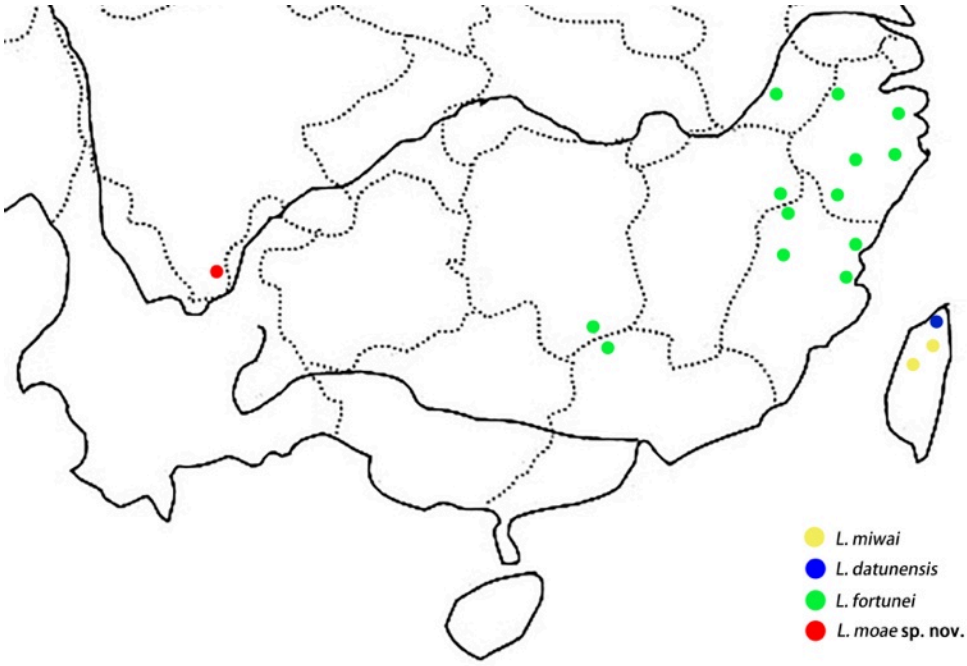

Fig. 6. Distribution of *Lucanus moae* **sp. nov.** and its related species.

In females, *Lucanus* species are often very similar and difficult to distinguish quickly, but the new species can be distinguished from other species by the feature combination of female genitalia.

Etymology. – The specific epithet is dedicated to Mrs. Xiao-Jing Mo, the author's mother, for her support and care all the time.

Remarks. – This new species should be assigned to the *Lucanus fortunei* group (*sensu* Huang & Chen 2010). Through the study of these specimens, we found that males of the new species have 2 color types at lest: 1) color mostly reddish brown on both head dorsal and pronotum, elytra blackish brown, all tibiae and femora with large, transverse, orange stripes on dorsal and ventral surfaces or 2) color mostly blackish brown to black on both dorsal and ventral surfaces, all tibiae are black and all femora with small, transverse, orange stripes on dorsal and ventral surfaces.
In *Lucanus* species, males of different sizes usually have different mandible types, males with bigger body size will have longer mandible and major inner tooth, and the number of inner teeth will also change. At present, only small and medium-sized males have been found in *Lucanus moae* **sp. nov.**, and we speculate that the large-sized males may have changed the morphology of the mandible. Therefore, in the process of species identification, external morphology and genital structure should be combined.

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Résumé

Qi Z.-H., 2021. – *Lucanus moae* **n**. **sp**., une nouvelle espèce du Sichuan, Chine (Coleoptera: Lucanidae: Lucaninae). *Faunitaxys*, 9(23): 1 – 7.

Une nouvelle espèce du genre *Lucanus* Scopoli, 1763 a été découverte dans la province du Sichuan, en Chine : *Lucanus moae* **n**. **sp**.. Dans cet article, la nouvelle espèce est décrite, illustrée, et les différences avec les espèces apparentées sont également discutées.

Mots clés. – Coleoptera, Lucanidae, *Lucanus*, *moae*, lucane, taxonomie, nouvelle espèce, description, morphologie, Sichuan, Chine.

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Illustration de la couverture : Natural habitat of *Lucanus moae* **sp**. **nov**..

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